

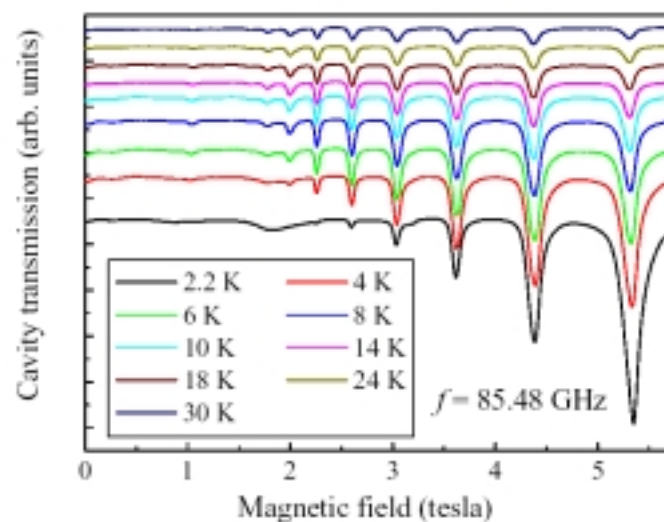
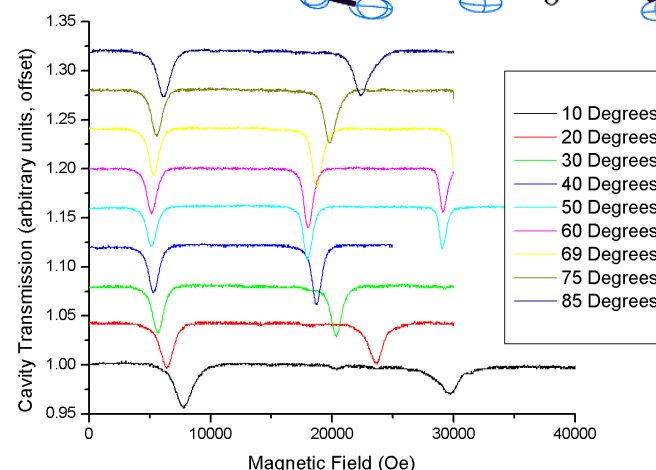
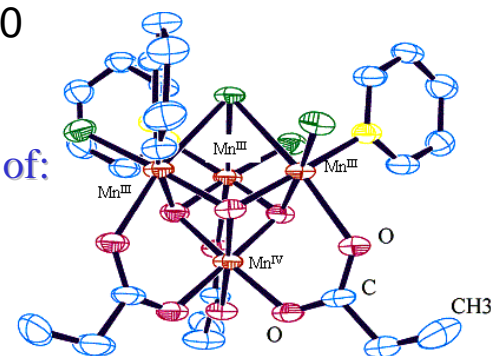
Acquisition of a microcalorimeter configured with a split-coil magnet

Stephen Hill, University of Florida, DMR0196430

An important goal in materials research is to understand how to utilize molecules in machines and devices. There is interest in molecular wires, molecular machines, molecular electronic devices, etc. One approach to the latter involves designing molecules that are bistable, i.e. having two or more states that are close in energy. The second requirement is that there be some type of controllable perturbation (magnetic field, pressure, temperature, etc.) that can be employed to convert the molecule from one state to the other. Our research has focused on transition metal molecules that exhibit magnetic bistability. Through our collaborations, as part of the NSF funded NIRT award, we have been able to team up with some of the foremost groups in the world studying molecules that are magnetically bistable. Experiments conducted at the University of Florida would not be possible without the instrumentation that was acquired through the MRI project reported here.

Other research activities have focused on the thermodynamics and electrodynamics of highly anisotropic molecular conductors. This subject is a rapidly emerging area in the science and technology of electronic materials, linking the realms of semiconductors, metals, and biological structures. Our work focuses mainly on organic charge transfer salts and inorganic layered oxides. These versatile low-dimensional systems are perfect for exploring most fundamental aspects of contemporary condensed matter physics, since their structures are easily tuned using intelligent chemistry. New discoveries will likely impact society through future technological developments.

EPR spectroscopy of:
 $\text{Mn}_4\text{O}_3(\text{OSiMe}_3)(\text{O}_2\text{CMe})_3(\text{dbm})_3$



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Brief summary of outreach activities:

- Two postdoctoral fellows, and graduate & undergraduate students have received interdisciplinary research training as a direct consequence of this project.
- An REU student, and a high school senior have also participated in this project.

Educational:

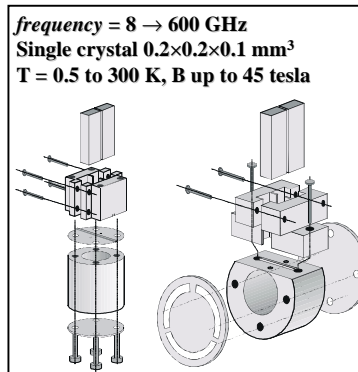
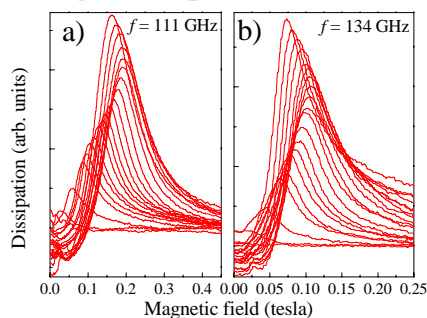
1 high school senior,
4 undergraduates,
3 grad students,
2 post-docs.

Broader impact:

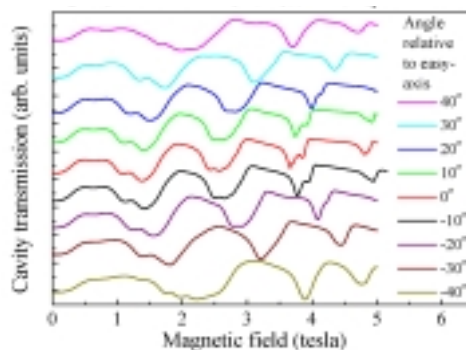
We have developed spectroscopic techniques that have found utility beyond the scope of the work supported by this grant. This has resulted in a multi-investigator, interdisciplinary collaboration (NSF funded) involving chemists and physicists. We have also contributed to the development of EPR instrumentation at the National High Magnetic Field Laboratory (shown right).



Josephson plasmon in an organic superconductor



EPR on molecular magnets



Instrumentation for angle dependent magnetic resonance experiments developed at UF

